

## **NFM 2022 - FIRST CALL FOR PAPERS**

The 14th NASA Formal Methods Symposium  
<https://easychair.org/conferences/?conf=nfm2022>  
May 24-27, 2022  
Pasadena, California, USA

The symposium is planned to be held in person at California Institute of Technology, but potentially transitioning to fully virtual if the COVID situation persists. Virtual presentations will be possible even if the conference is held in-person.

The symposium has NO registration fee for presenting and attending.

### **IMPORTANT DATES**

Abstract Submission: December 3, 2021  
Paper Submission: December 10, 2021  
Paper Notifications: February 4, 2022  
Camera-ready Papers: March 4, 2022  
Symposium: May 24-27, 2022

### **THEME OF SYMPOSIUM**

The widespread use and increasing complexity of mission-critical and safety-critical systems at NASA and in the aerospace industry requires advanced techniques that address these systems' specification, design, verification, validation, and certification requirements. The NASA Formal Methods Symposium (NFM) is a forum to foster collaboration between theoreticians and practitioners from NASA, academia, and industry. NFM's goals are to identify challenges and to provide solutions for achieving assurance for such critical systems. The focus of the symposium will be on formal/rigorous techniques for software assurance, including their theory, current capabilities and limitations, as well as their potential application to aerospace during all stages of the software life-cycle.

The NASA Formal Methods Symposium is an annual event organized by the NASA Formal Methods (NFM) Research Group, composed of researchers spanning six NASA centers. The organization of NFM 2022 is being led by the Jet Propulsion Laboratory (JPL), located in Pasadena, California.

## **TOPICS ON INTEREST**

Topics of interest include, but are not limited to, the following aspects of formal methods:

### **Advances in formal methods**

- Interactive and automated theorem proving
- SMT and SAT solving
- Model checking
- Static analysis
- Runtime verification
- Automated testing
- Specification languages, textual and graphical
- Refinement
- Code synthesis
- Design for verification and correct-by-design techniques
- Requirements specification and analysis

### **Integration of formal methods techniques**

- Integration of diverse formal methods techniques
- Use of machine learning and probabilistic reasoning techniques in formal methods
- Integration of formal methods into software engineering practices
- Combination of formal methods with simulation and analysis techniques
- Formal methods and fault tolerance, resilient computing, and self healing systems
- Formal methods and graphical modeling languages such as SysML, UML, MATLAB/Simulink
- Formal methods and autonomy, e.g., verification of systems and languages for planning and scheduling (PDDL, Plexil, etc.), self-sufficient systems, and fault-tolerant systems.

### **Formal methods in practice**

- Experience reports of application of formal methods on real systems, such as autonomous systems, safety-critical systems, concurrent and distributed systems, cyber-physical, embedded, and hybrid systems, fault-detection, diagnostics, and prognostics systems, and human-machine interaction analysis.
- Use of formal methods in systems engineering (including hardware components)
- Use of formal methods in education
- Reports on negative results in the development and the application for formal methods in practice.
- Usability of formal method tools, and their infusion into industrial contexts.
- Challenge problems for future reference by the formal methods community. The formulation of these papers can range from plain English description of a problem over formal specifications, to specific implementations in a programming language.

## **NASA OPEN SOURCE**

Courageous authors, who want to delve in open source software being applied in real NASA missions, and find possible connections to and applications of Formal Methods, are invited to visit the open source repositories for the following two frameworks for programming flight software: F' (<https://nasa.github.io/fprime/>) and cFS (<https://cfs.gsfc.nasa.gov/>).

## **SUBMISSIONS**

There are two categories of submissions:

1. Regular papers describing fully developed work and complete results (maximum 15 pages, excluding references);
2. Short papers on tools, experience reports, or work in progress with preliminary results (maximum 6 pages, excluding references).

Additional appendices can be submitted as supplementary material for reviewing purposes. They will not be included in the proceedings.

All papers must be in English and describe original work that has not been published. All submissions will be reviewed by at least three members of the Program Committee.

We encourage authors to focus on readability of their submissions.

Papers will appear in the Formal Methods subline of Springer's Lecture Notes in Computer Science (LNCS) and must use LNCS style formatting

(<https://www.springer.com/gp/computer-science/lncs/conference-proceedings-guidelines>).

Papers must be submitted in PDF format at the EasyChair submission site:

<https://easychair.org/conferences/?conf=nfm2022>.

Authors of selected best papers will be invited to submit an extended version to a special issue in Springer's Innovations in Systems and Software Engineering: A NASA Journal (<https://www.springer.com/journal/11334>).

## **ARTIFACTS**

Authors are encouraged, but not strictly required, to submit artifacts that support the conclusions of their work (if allowed by their institutions). Artifacts may contain software, mechanized proofs, benchmarks, examples, case studies and data sets. Artifacts will be evaluated by the Program Committee together with the paper.

## **ORGANIZERS**

### **PC chairs**

- Klaus Havelund, JPL, USA
- Jyo Deshmukh, USC, USA
- Ivan Perez, NIA, USA

### **Application Advisors**

- Robert Bocchino, JPL, USA
- John Day, JPL, USA
- Maged Elasaar, JPL, USA
- Amalaye Oyake, Blue Origin, USA
- Nicolas Rouquette, JPL, USA
- Vandí Verma, JPL, USA

Application advisors advise the PC chairs to ensure a strong connection to the problems facing NASA.

### **Local Organizers**

- Richard Murray, Caltech, USA
- Monica Nolasco, Caltech, USA

### **Program Committee**

- Aaron Dutle, NASA, USA
- Alessandro Cimatti, Fondazione Bruno Kessler, Italy
- Anastasia Mavridou, SGT Inc. / NASA Ames Research Center, USA
- Anne-Kathrin Schmuck, Max-Planck-Institute for Software Systems, Germany
- Arie Gurfinkel, University of Waterloo, Canada
- Bardh Hoxha, Toyota Research Institute North America, USA
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- Leonardo Mariani, University of Milano Bicocca, Italy
- Lu Feng, University of Virginia, USA
- Marcel Verhoef, European Space Agency, The Netherlands
- Marie Farrell, Maynooth University, Ireland
- Marieke Huisman, University of Twente, The Netherlands
- Marielle Stoelinga, University of Twente, The Netherlands
- Martin Feather, Jet Propulsion Laboratory, USA
- Martin Leucker, University of Luebeck, Germany
- Michael Lowry, NASA, USA
- Misty Davies, NASA, USA
- Natasha Neogi, NASA, USA
- Nicolas Rouquette, Jet Propulsion Laboratory, USA
- Nikos Arechiga, Toyota Research Institute, USA
- Rajeev Joshi, Amazon Web Services, USA
- Stanley Bak, Stony Brook University, USA
- Sylvie Boldo, INRIA, France
- Vandí Verma, NASA, USA
- Willem Visser, Amazon Web Services, USA

## **CONTACT**

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## **LAST UPDATE**

2021-09-20